

GENDER EFFECT ON THE USE OF MODIFIED BORG AND VISUAL ANALOG SCALES IN THE EVALUATION OF DYSPNEA IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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ABSTRACT

Objective: To investigate the gender effect on the use of Modified Borg Scale (MBS) and Visual Analog Scale (VAS) for the effort dyspnea evaluation in Chronic Obstructive Pulmonary Disease (COPD) patients.

Methodology: Fifty-two patients with severe COPD were included in this study. Pulmonary function (spirometry), quality of life (Chronic Respiratory Disease Questionnaire-CRDQ), exercise capacity (6-minute walking test), and dyspnea severity (Modified Borg and Visual Analog Scales) were evaluated.

Results: The dyspnea severity scores were higher and walking distance was shorter in women ($p < 0.05$). The scores of the both scales were correlated with each other in both genders ($p < 0.05$). In men, the dyspnea scores obtained by MBS and VAS scales were significantly correlated with 6-minute walking distance ($p = 0.001$) and total score of CRDQ ($p = 0.001$). On the other hand, the dyspnea severity score of the women obtained by MBS was correlated with only the total score of CRDQ ($p < 0.05$).

Conclusion: The results of our study show that gender has an effect on dyspnea perception obtained by MBS and VAS. We suggest that MBS and VAS should be used for men whereas MBS may be more convenient for women in the evaluation of dyspnea in severe COPD.

KEY WORDS: Dyspnea, Gender, COPD, Modified Borg Scale, Visual Analog Scale.

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INTRODUCTION

Dyspnea is one of the most significant symptoms occurring during the progression of chronic obstructive pulmonary disease (COPD).¹ This symptom results from pulmonary hyperinflation, weakness of inspiratory muscles, increased ventilation, voluntary hyperventilation, reflexively driven hyperventilation, increased respiratory work load, and impaired function of the inspiratory muscles related to increased resistive or elastic loads.²

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The evaluation of dyspnea is important. As a subjective symptom, severity of dyspnea cannot be evaluated satisfactorily using methods such as spirometric measurement and blood gas analysis.³ The effort dyspnea determined at the end of exercise is accepted as the best indicator of dyspnea.⁴ Several scales are available to evaluate dyspnea. Modified Borg Scale (MBS) and Visual Analog Scale (VAS), are known to be simple and partially objective, have usually been used to evaluate effort dyspnea in clinical practice.⁵⁻⁷

The interpretation of dyspnea scales depends solely on the statements of the patients.⁸ Patients may express the severity of symptoms wrongly during the obtainment of clinical history.⁹ One may consider that this may result from gender differences in COPD patients. Because the effect of gender factor on dyspnea perception has been investigated in various studies. It has been shown that perceived dyspnea severity is higher in women than in men.¹⁰⁻¹³ Furthermore, it has been determined that, in women, the ability of defining and coping with the symptoms is affected by gender,¹⁴ respiratory symptoms appear in earlier ages,¹¹ perceived quality of life is lower while anxiety and depression severities are higher^{12,14} and 6-minute walking distances, which constitute an indicator of exercise capacity, are shorter.¹¹ However, although the effect of gender on dyspnea and the mechanisms behind its occurrence have been researched in the literature, the effect of gender on the choice of the appropriate method to be used in the evaluation of effort dyspnea in severe COPD has been overlooked. Thus, the purpose of our study was to investigate the gender effect on the use of MBS and VAS dyspnea scales for the effort dyspnea evaluation in severe COPD patients.

METHODOLOGY

Patients and Clinical Features: Fifty-two patients (30 men, 22 women) with severe COPD (according to the Global Initiative for Chronic Obstructive Lung Disease criteria) who were meeting the inclusion criteria were assessed.¹⁵ All cases

were evaluated on the second week after admission to the clinic. Thus, each patient was clinically stable during the study.

Inclusion criteria were as follows: having forced expiratory volume in one second value (FEV₁), which was measured during the last 6 months, between <30% and <50% of the predicted, having no changes in standard medical treatment over the last 2 weeks, having no uncontrolled cardiac, musculoskeletal, and/or neurological diseases, and willing to participate in the study.

Exclusion criteria were to be a patient who did not meet the inclusion criteria and wanted to leave from the study.

The study protocol was approved by University Clinical and Laboratory Researches Ethics Committee and the methods to be applied were explained to the participants whose written consents were obtained.

Study Design: The main characteristics of the patients including the demographic and clinical data were recorded. Pulmonary function, quality of life, exercise capacity, and dyspnea severity of the patients were evaluated.

Outcome Measurements

Pulmonary Function Test: Pulmonary function was evaluated with spirometry (SensorMedics, Inc, Anaheim, CA, USA) according to the ATS criteria.¹⁶ Forced vital capacity (FVC), FEV₁, FEV₁/FVC ratio and their percentages according to the predicted values were recorded.

Chronic Respiratory Disease Questionnaire (CRDQ): The CRDQ is an interviewer-administered questionnaire measuring both physical and emotional aspects of chronic respiratory disease. Higher scores indicate better health-related quality of life.¹⁷

6-Minute Walking Test (6MWT): 6MWT was applied according to Guyatt et colleagues. The distance walked in 6 minutes (6MWD) and before and after the 6MWT; heart rate, blood pressure, peripheral oxygen saturation (SpO₂, with Palco 400 Model pulse oxymeter, Santa Cruz, USA), and severity of dyspnea were recorded.¹⁸ The severity of dyspnea was scored using MBS and VAS.

Modified Borg Scale (MBS): It is a 10 point scale with a non-linear scaling scheme using descriptive terms to anchor the responses from the participants (0 - no dyspnea, 10 - very very severe dyspnea).⁴

Visual Analog Scale (VAS): VAS is consisted of a horizontal line. The VAS is scored from 0 to 100 millimeters, but the subjects are unaware of the numbers reflecting the length of the scale (0 - no dyspnea, 100 - very very severe dyspnea).⁵

Statistical Analysis: All analyses were performed using SPSS (version 11.0). Data were presented as mean±standard deviation or correlation coefficient. $p < 0.05$ was considered significant. Mann-Whithney U test, pearsons's test and Spearman correlation analysis and were used in two-independent group comparisons and in the determination of correlation between variables, respectively.

RESULTS

Fifty-two patients with severe COPD were divided into two groups as the men (n=30) and the women (n=22). The demographical and clinical characteristics of the groups were similar except from height (Table-I). The educational level of the groups were similar (8 education years > 54.5% for women; 56.7% for men, $p=0.17$). The smoking history of the ex-smokers was

Table-I: The basic characteristics of the patients

	Men (n=30) X±SD	Women (n=22) X±SD	p
Age, years	67.11±2.22	66.05±10.28	0.74
Height, cm	166.15±5.53	159.36±8.52	0.05*
Weight, kg	68.50±22.93	67.82±13.86	0.80
BMI, kg/m ²	25.72±9.16	26.85±5.17	0.06
FVC, %	50.73±12.40	53.00±14.48	0.69
FEV ₁ , %	34.41±7.23	36.73±9.04	0.22
FEV ₁ /FVC, %	56.70±10.02	52.06±12.44	0.09

* $p < 0.05$, BMI: Body mass index; FVC: Forced vital capacity; FEV₁: Forced expiratory volume in one second.

similar between the groups (22 men, 15 women).

The CRDQ scores were also similar between the two groups ($p=0.08$, Table-II). According to the MBS and VAS, the dyspnea severities were similar before the 6MWT whereas the dyspnea scores were higher in women group after the 6MWT ($p < 0.05$, Table-II). The mean 6-minute walking distance of the men group was longer (130.75±21.07 vs 88.42±10.22 m for the men and women groups, respectively, $p=0.01$).

MBS and VAS scores were correlated with each other in both gender ($p < 0.05$). However, the scores of the both scales were not correlated with demographical and pulmonary function

Table-II: The dyspnea severity and the quality of life questionnaire scores

	Men X±SD	Women X±SD	p
Modified Borg Scale Score			
Before the 6MWT	3.35±2.47	3.23±2.76	0.48
After the 6MWT	8.27±1.17	9.09±0.75	0.01*
Visual Analog Scale Score			
Before the 6MWT	36.02±22.40	38.96±29.02	0.30
After the 6MWT	84.10±11.71	91.74±7.69	0.03*
CRDQ			
Dyspnea	9.25±2.37	8.77±2.48	0.14
Fatigue	12.52±0.65	9.94±7.46	0.12
Emotional Function	15.29±1.04	10.14±2.00	0.07
Mastery	19.88±2.47	22.44±0.75	0.27
Total Score	56.26±6.43	53.28±17.1	0.08

* $p < 0.05$, 6MWT: 6-minute walking test, CRDQ: Chronic respiratory diseases questionnaire

values in both groups. The scores of dyspnea severity obtained by MBS and VAS were correlated with 6MWD ($p=0.001$) and total quality of life score ($p=0.001$) in the men group. Whereas only the score of dyspnea severity obtained by MBS was correlated with the total quality of life score in the women group ($p<0.05$, Tables III-IV).

DISCUSSION

The main findings of this study are; effort dyspnea scores are higher in women, the scores of the both scales are related to each other, however, the scores of the both scales are related with different functional outcome parameters in both genders.

In previous studies it has been shown that compared with men, women with COPD report more dyspnea for the same degree of airflow obstruction using different dyspnea scales including MBS, VAS, Medical Research Council Dyspnea Scale, and Baseline Dyspnea Index. According to these studies, the perception, coping strategies, and the time of the occurrence

of the respiratory symptoms for women are different from men. MBS and VAS are the frequently used and simple scales to score the dyspnea severity in COPD patients among these scales.¹⁰⁻¹³ Similar to these above-mentioned studies, we found higher effort dyspnea scores obtained by MBS and VAS after the 6MWT for women, although we did not determine any difference in dyspnea scores before the 6MWT in our study.

Effort dyspnea has a greater effect on walking capacity³ and 6MWD and its progressive decline are important predictors of mortality in patients with severe COPD.¹⁹ The 6MWD of healthy women was reported about 82-84 meters shorter than that of healthy men^{20,21} and this difference was shown 41-74 meters shorter for women than men with mild-to-moderate COPD, 43 m shorter for women than men with severe COPD patients.^{11,12,19,22} As for our study, the difference in walking distance between genders, who had similar physical characteristics, pulmonary function test results, and quality of life scores, was found to be 42 meters for severe

Table-III: The relationship between MBS score and functional outcome parameters

MBS Score After the 6MWT	Men <i>r</i>	Women <i>r</i>
Age, years	0.19	0.29
BMI, kg/m ²	0.08	-0.09
FVC, %	-0.26	-0.36
FEV ₁ , %	-0.20	-0.08
FEV ₁ /FVC, %	0.10	0.21
Total score of CRDQ	-0.69**	-0.43*
6MWD, meters	-0.81**	-0.34
VAS Score After the 6MWT	-0.77**	-0.52*

Values (*r*) are Pearson's correlation coefficients.

*0.01 < p < 0.05; **0.001 < p < 0.01

MBS: Modified Borg Scale; 6MWT: 6-minute walking test; BMI: Body mass index; FVC: Forced vital capacity; FEV₁: Forced expiratory volume in one second; CRDQ: Chronic respiratory diseases questionnaire; 6MWD: 6-minute walking distance; VAS: Visual Analog Scale.

Table-IV: The relationship between VAS score and functional outcome parameters

VAS Score After the 6MWT	Men <i>r</i>	Women <i>r</i>
Age, years	0.22	0.26
BMI, kg/m ²	-0.01	-0.06
FVC, %	-0.18	-0.35
FEV ₁ , %	-0.06	-0.04
FEV ₁ /FVC, %	0.08	0.25
Total score of CRDQ	-0.57**	-0.34
6MWD, meters	-0.79**	-0.29
MBS Score After the 6MWT	-0.77**	-0.52*

Values (*r*) are Pearson's correlation coefficients.

*0.01 < p < 0.05; **0.001 < p < 0.01

VAS: Visual Analog Scale; 6MWT: 6-minute walking test; BMI: Body mass index; FEV₁: Forced expiratory volume in one second; FVC: Forced vital capacity; CRDQ: Chronic respiratory diseases questionnaire; 6MWD: 6-minute walking distance; MBS: Modified Borg Scale.

COPD patients. This greater difference than the values reported in previous above-mentioned studies assessing healthy controls and mild-to-moderate COPD patients might be related to the higher perceived dyspnea severities after the 6MWT of women COPD patients with the same characteristics. In accordance with these above-mentioned relationships between longer walking distance and lower dyspnea perception for men, we found that 6MWD was correlated with MBS and VAS scores only in men in our study. Thus, we suggest that MBS and VAS are more appropriate scales to show exercise capacity in men severe COPD patients than women.

It has been shown in various studies that the gender affects quality of life. It was reported that women are less confident in dealing with respiratory symptoms and have lower perceived quality of life and higher severity of psychological symptoms such as anxiety and depression in mild-to-moderate COPD patients.^{3,12,23} However, the CRDQ scores that define the quality of life of the men and women patient groups were similar in our study, although CRDQ scores were correlated with both scales in men while they were only correlated with MBS in women. This finding could be related to the same baseline dyspnea severities of the men and women in our study. Because Martinez et al. showed that baseline dyspnea is the main determinant of the health related quality of life in severe COPD patients, whereas as a psychological factor is the main determinant of the health related quality of life in mild-to-moderate severities.³

In conclusion, we suggest that there is a gender effect on the perception of effort dyspnea and the use of MBS and VAS scales in the evaluation of dyspnea for the patients with severe COPD. MBS and VAS scales are more descriptive to presentation functional outcome parameters in men, whereas MBS scale is more convenient for women with severe COPD. Thus, we recommend that the effect of the gender on the use of MBS and VAS scales in severe COPD patients should be taken into consideration in clinical practice.

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